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AUSTRALIA'S AGRICULTURAL RESOURCES

AUSTRALIAN AGRICULTURE AND THE WAR EFFORT

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# AUSTRALIA'S AGRICULTURAL RESOURCES . . . . .

By W. I. Ladejinsky*

*The fact that Australia's 7 million people live on a continent having a land area of about 3 million square miles has been regarded frequently as evidence that the country is underpopulated and underdeveloped. It has been held in some quarters that the land could support a much larger population without lowering the standard of living. In reality, more than half of the country is so dry as to have practically no economic value. Only 2 percent of the total area is cropland, and much of that area is marginal with respect to rainfall and soil. The great pastoral industry, from which about 25 percent of the world's wool supply is drawn, needs less rainfall than do the crops, but there also the marginal areas have been reached. If the distinction between "Economic Australia" and "Empty Australia," as drawn by Professor Griffith Taylor, is kept in mind, the Australian land-utilization problem may be more clearly understood. The following outline of Australia's agricultural resources attempts to reflect their real magnitude and to point out the factors limiting their expansion. Australia's wartime agricultural problems are not discussed in this article.*

## THE LAND AND THE PEOPLE

Australia, the smallest of the continents, is situated in the Southern Hemisphere and occupies an area of 2,974,000 square miles. On the west and east, the Indian and Pacific Oceans, respectively, wash the shores of this island-continent, whereas on the north, the country is bounded by the Timor and Arafura Seas and on the south by the Southern Ocean and Bass Strait. The coast line of Australia is 12,210 miles; the longest distance from north to south is 2,000 miles, and east-west 2,400 miles. The area of Australia is almost as great as that of the United States or about 25 times as large as the British Isles. (See figure 1).

### Topography

To a greater degree than in most countries, the pattern of land utilization in Australia is shaped by the powerful and persistent influence of natural conditions, such as topography, soils, and climate. Most of the country is relatively level, and only about 5 percent of its entire area has an altitude exceeding 2,000 feet. In linking topography with the agricultural enterprise, Australia may be split into four physical divisions. First, there is the great plateau in the west, extending over practically half of the continent. This area, because of scanty rainfall and poor soil, has no agriculture and very few inhabitants. Secondly, there is the Central Basin that extends across the eastern half of the continent from north to south. Artesian wells enable stock to be pastured over the northern and eastern portions.

* Office of Foreign Agricultural Relations.

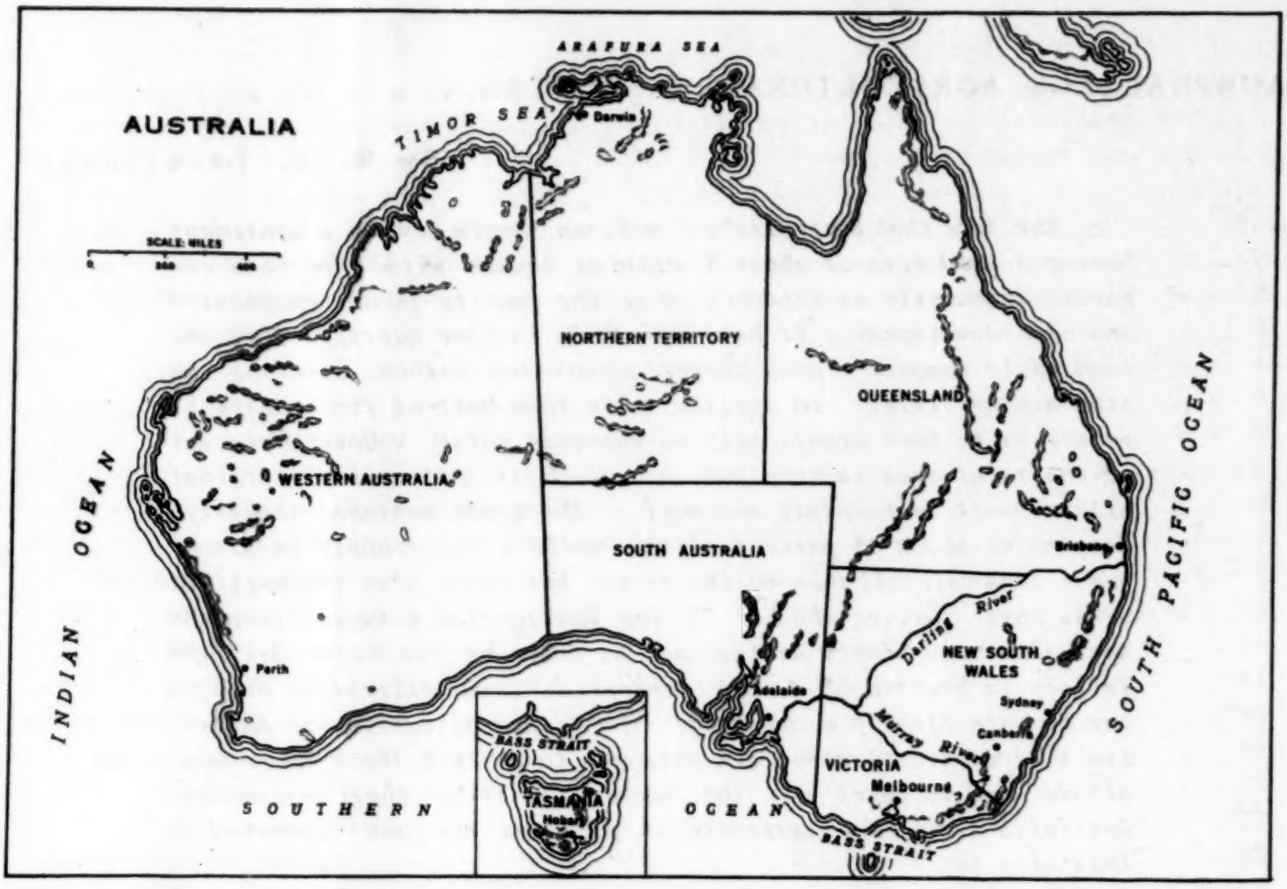


FIGURE 1.—Map of Australia.

In the southern portion of the Central Basin area lies Australia's only river system worth mentioning, the Murray-Darling system. Citrus groves and vineyards as well as sheep stations and wheat farms are found there. On the other hand, the western portion of the Basin is one of the most arid regions of Australia. The third division is formed by the Eastern Highland region, comprising a series of plateaus and mountain knobs, from 50 to 100 miles in width that extends the full length of the east coast. The slopes to the west form Australia's richest grasslands. The fourth division is accounted for by the Coastal Plains, which, particularly between the Great Dividing Range and the sea, are rich and important agricultural regions.

## Soils

A classification of Australian soils reveals about ten groups greatly varying in quality, most of which are deficient in phosphates. From the point of view of land utilization, the Australian black earths are apparently the best. These soils "are principally associated with the pastoral industry, particularly with sheep grazing; but on the Darling Downs of Queensland they are utilized for wheat-growing, while in regions of higher rainfall ... they are used for cotton-growing and for dairying."[1] Next in importance are the gray and brown soils. They form a part of semiarid Australia and account for some of the best grassland of Australia, whereas in some parts they

[1] WADHAM, S. M., and WOOD, G. L., LAND UTILIZATION IN AUSTRALIA, Melbourne University press, 1939, p. 57.

represent the most fertile wheat area in Australia. The so-called mallee soils,[2] which seem to be unknown in other parts of the world, constitute a very important group.

The mallee soils "are low in nitrogen, organic matter, and phosphoric acid. Under natural conditions, the mallee soils have little or no pastoral value, and their development for wheat-growing has been one of the most interesting developments in Australian agriculture."[3] As against the mentioned types of soil upon which Australian agriculture feeds itself, there are the huge stretches of desert-steppe and desert-sandhill types that cover more than half the surface of the continent. These poor soils, coupled with low rainfall (less than 10 inches) and high evaporation, have no agricultural value.

## Climate

### Temperature

With the exception of the coastal areas in the east, south, and parts of the west, Australia is a hot, arid continent. The temperatures in themselves, however, except in the far north, are not a hindrance to white settlement. In the sub-tropical north (in Darwin), the average mean temperature ranges from 83 degrees in February to 77 degrees in July. The comparative figures for Sydney, on the east coast, are 71 and 53 degrees. In general the temperature is highest in the northwestern corner of Australia and lowest in the southeast.

### Rainfall

In Australia, precipitation is the crucial factor in agricultural development. According to one writer, "there is no more pregnant saying about Australia than that which characterizes so much of the continent, to the effect that 'the Australian Government is not leasing land but *rainfall* to the settlers.' Hence of all the varied climatic elements, the decisive one is the rainfall."[4]

TABLE 1.–*Average annual rainfall distribution*

| ANNUAL AVERAGE | TOTAL[1] | ANNUAL AVERAGE | TOTAL[1] |
|---|---|---|---|
| | *Square miles* | | *Square miles* |
| Under 10 inches | 1,067,357 | 25-30 inches | 224,834 |
| 10-15 inches | 603,036 | 30-40 inches | 214,547 |
| 15-20 inches | 358,766 | Over 40 inches | 195,002 |
| 20-25 inches | 308,262 | Total area | 2,971,804 |

[1] Over an area of 2,777 square miles no records are available.
Compiled from official sources.

The table on rainfall distribution in Australia gives meaning to the expression: "Empty Australia vs. Economic Australia." The general insufficiency of rainfall is aggravated by its lack of seasonal uniformity and reliability and a high degree of evaporation. Fairly good rainfall (30 inches upward) prevails in the northern coastal area of Australia, but the rainy season lasts there only during summer months (December, January, February and March), with practically no precipitation during the remainder of the year. Consequently, this area remains almost uninhabited. On the other hand, along the east coast an equal volume of rain is more uniformly distributed throughout the year.

[2] The name derives from a scrub of dwarf eucalyptus known as mallee.

[3] PRESCOTT, J. A., THE SOILS OF AUSTRALIA IN RELATION TO VEGETATION AND CLIMATE, Bulletin 52, Council for Scientific and Industrial Research, Melbourne, 1931, pp. 62-63.

[4] TAYLOR, GRIFFITH, AUSTRALIA, London, 1940, p. 62.

Some of the arid and semiarid regions of Australia could be put to pastoral use but for the unreliability of the rainfall. The average variability of the rainfall in the arid regions is over 30 percent. On the whole, "In more than one-third of Australia drought is a permanent condition, while exactly one-half of Australia receives practically no rain for six months of the year. It is, however, the borderlands between these arid regions and the well-watered districts where King Drought is most feared. For here grows our main wheat crop, and here are situated our chief stock regions."[5]

When Australia is reduced to "economic" proportions - with "empty" Australia eliminated - the country shrinks perceptibly, particularly from the point of view of crop production. It appears then that the land in crops, fallow, and orchards is only about 2.5 percent of the total area of Australia.

## Population and Settlement

On December 31, 1941, Australia had a population of 7,137,221, excluding about 52,000 full-blooded Australian aboriginals. The density of population for the whole of Australia is but 2.4 persons per square mile, which is lower than that in any other country. Actually, of course, the density is most uneven because of the dependence of settlement on rainfall. The whole of the northwest section of Australia, comprising over 50 percent of the total area, contains no more than one-third of one percent of the Australian population. Most of the population is concentrated along the eastern, southern, and extreme southwestern fringes of the country.

Urbanization of the population is a characteristic feature of Australia. Thus 47 percent of the population (1933 census) was located in the metropolitan areas of the six capital cities, 17 percent in the provincial cities, and 36 percent in rural areas. The occupational distribution of the population reflects the country's urbanization. Of an estimated total of 3,155,621 breadwinners, over 27 percent were engaged in industry; 14 percent in commerce and finance; and only 17 percent in agriculture, including grazing and dairying. A number of other nonagricultural occupations make up the total.

There has been no actual decline in the number of people engaged in agriculture over a period of years, but there has been a decline relative to the rise in urban population. In a country such as Australia, where the national economy is still based primarily on pastoral and agricultural production, the relatively small percentage of people engaged in agriculture is perhaps surprising. However, considering the character of Australian agriculture, it need occasion no great surprise.

Because of climatic and soil conditions, closer settlement on relatively small farms has met with little success. The development of extensive, large-scale pastoral (sheep and cattle) and fairly large-scale cropping (wheat) industries predominates, and these require relatively small working forces. In Australia, therefore, small numbers of people manage large areas. In addition to this specifically Australian factor, there are also the features of mechanization and scientific farming that contribute to urbanization in every progressive country. Under those circumstances" ... the supply of food [and of other agricultural products] ... requires the labour of a continuously diminishing *proportion* of the community ... consequently there has been a continuous release ... of labour which has been applied to producing the means of

[5] TAYLOR, GRIFFITH, AGRICULTURAL CLIMATOLOGY OF AUSTRALIA, p. 351; from the quarterly Journal of the Royal Meteorological Society, vol. XLVI, No. 196.

gratifying the unlimited wants of a less primitive kind."[6] All these factors tend to explain why the main source of Australian wealth is produced by a relatively small proportion of the country's population.

## Land utilization and land tenure

Rainfall, soil, topography, low density of population, and foreign markets have conspired to create a rather extensive and specialized system of commercial farming as distinct from subsistence farming. The number of crops grown is relatively small. The all-important sheep and, by comparison, the less important wheat constitute the backbone of Australian agriculture.

A broad classification of the land, which is by no means exact in all respects, clearly shows why the sheep is king in Australia. Thus, out of a total area of 1,904 million acres, 55 percent (1,047 million acres) is under pasture. This includes improved pastures in the strict sense of the word and also grazing land more or less improved in character, but mainly bearing its native vegetation. Forty percent (762 million acres) is wasteland due to the low or uncertain rainfall; 2 percent (38 million acres) is under forests, but of a kind that does not produce commercial timber; and only 3 percent (57 million acres) of the area is classified as crop and orchard land.

These data are not indicative of the area actually utilized. Nor are official agricultural statistics helpful in this respect, for while giving the number of sheep holdings, the area exploited by them is not shown. All that can be said is that, with the exception of cropped area, the greater part of the billion acres leased and of the 183 million acres owned by the farmers are utilized as pasture lands. On the other hand, the land devoted to crops is given as indicated in table 2. The outstanding feature of these figures is that they represent but 2 percent of the total area of Australia, whereas in the United States, the land available for crops has been estimated at 27 percent of the total.

TABLE 2.—*Utilization of land mainly devoted to agriculture, 1938-39*

| TYPE OF UTILIZATION | AREA | PERCENTAGE OF TOTAL |
|---|---|---|
| | *Acres* | *Percent* |
| Area under crops | 23,254,732 | 49 |
| Fallow land | 10,862,119 | 23 |
| New ground cleared during season and previously cropped land unused during season | 13,296,317 | 28 |
| Total | 47,413,168 | 100 |

Compiled from official sources.

As to the future expansion of acreage under crops and pasture, the answer seems to be, if the prevailing system of extensive land use be continued, that the possibilities are limited. Because of climatic and soil limitations, and especially the former," ... there remains in Australia no large area of land which can be brought into agricultural and pastoral use with certainty of success."[7] This view is upheld by Griffith Taylor in the following words: "There are no really attractive unused lands left in Australia except in *alienated* [privately owned] portions of the East and South."[8] The same idea, but more fully developed, is expressed by the authors of an exhaustive study on land utilization in Australia. Their conclusions should put to

[6] McPHEE, E. T., "The Urbanisation of Australian Population," p. 172 in the "Peopling of Australia," edited by Phillips, P. D., and Wood, G. L., Melbourne, 1930.

[7] WADHAM, S. M., "Land Utilisation," p. 38 in "The Annals," Nov. 1931.

[8] TAYLOR, GRIFFITH, AUSTRALIA, Melbourne, 1940, p. 7.

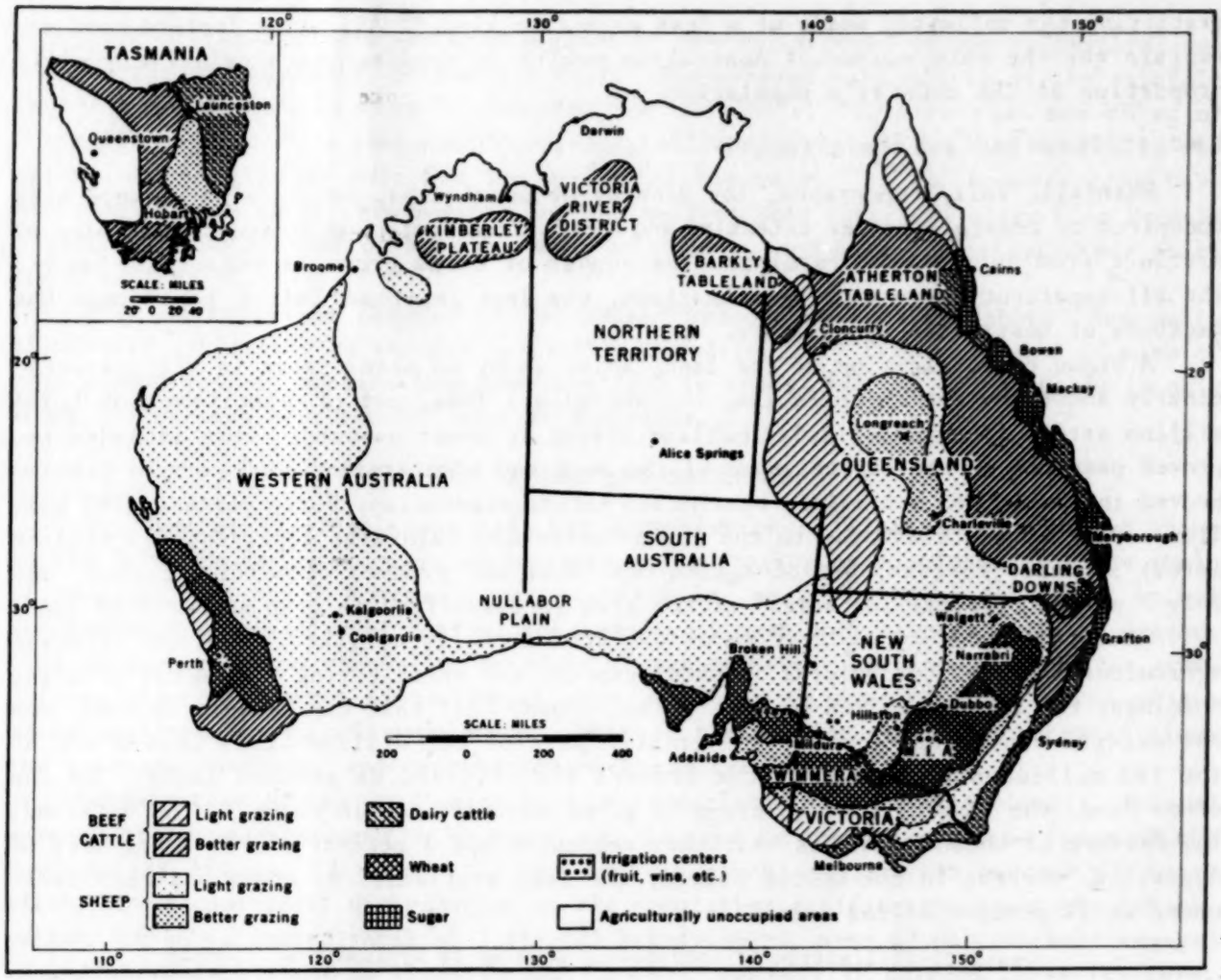


FIGURE 2.—Principal land-use regions of Australia. (After Wadham, Wood and others.)

rest the still prevailing notions that vast empty spaces in Australia presuppose considerable agricultural resources capable of supporting tens of millions of people. The solution, as they see it, is in better utilization of the land already in the hands of the producers rather than in expanding into largely unproductive lands.

The data concerning land tenure are more precise than those on land utilization. The land held under lease from the Australian Government represents over 1 billion acres or 53 percent of the total, and the land actually owned (134 million acres), as well as that portion title to which is about to be acquired (49 million acres), constitute about 10 percent; the remainder is still classified as crown land. Agricultural statistics for 1937-38 record 233,125 private holdings with an area of 180,569,008 acres, or 774.6 acres per holding.[9] Actually this does not reflect the real state of affairs, for the cited average is made up of holdings ranging from less than 100 acres to 50,000 acres and over. The outstanding feature of land distribution in Australia is the concentration of the land in a relatively small number of holdings.

[9] In 1938-39 the total area of rural holdings, which did not include all the leased land, was given as 887 million acres, and distributed among 254,294 holdings, or 3,488 acres per holding.

Thus, two-thirds of them comprise 12.3 percent of the land, as against 18.7 percent of the holdings that include 74.4 percent of all the privately held land.

The development of large-scale farming, its persistence, and continual growth must be attributed mainly to "King Drought." The frontier in Australia, unlike the American frontier, did not offer opportunities for farmers with small resources. The little capital and the little help from the Government enabled Americans to establish themselves firmly on homesteads of 160 acres, thus progressively moving the frontier westward. But in the greater part of Australia no farmer could settle on 160 acres or many times that amount with any degree of success. Fifty years of great effort and expenditure on the part of Australian States to develop a "sturdy yeomanry" after the British model have been barren of substantial results.

## PASTORAL INDUSTRY

### Sheep

The Australian pastoral industry is a combination of sheep and cattle, with the former predominating. The limitations placed upon cultivation of crops by climatic conditions do not necessarily apply to the pastoral industry, more especially with respect to sheep. "In the semi-arid regions of the interior the feed is not suited to cattle, even if water supplies were adequate, and these great inland tracts must remain permanent sheep pastures, secure from the competition of wheat growing or cattle raising."[10] The opportunities thus afforded have not been neglected, and in time the raising of sheep primarily for their wool became the mainspring of Australia's economic development. Such is the case even today, despite the fact that other branches of agriculture and manufacturing have come to occupy an important place.

The growth of the sheep industry has not been a continuous one. Serious depressions mainly due to droughts have from time to time left their imprint on pastoral history. Thus the droughts of 1892-1902 must be held largely responsible for the reduction in the flocks from the peak of 106 million in 1891 to 54 million in 1902. The industry has recovered since then, and every year since 1925 the sheep flocks have exceeded 100 million, notwithstanding the average annual slaughter of 19 million sheep. In 1938 Australian sheep numbers were estimated at 111 million, compared with 84 millions in Russia, 52 million in the United States, and 46 million sheep in Argentina. In 1941 the number of sheep in Australia reached a peak of 125 million.

The large-scale nature of the sheep industry is illustrated by the fact that the average number of sheep per holding is 1,146, with holdings of 5,000 sheep and more dominating the industry. Only 10.4 percent of the holdings had a total of 51.4 percent of all the sheep, while those of 50,000 acres and more, accounting for 1.6 percent of all the holdings, possessed 17.4 percent of all the sheep.

TABLE 3.—Australian sheep numbers and wool production

| YEAR | NUMBER OF SHEEP | PRODUCTION[1] | YEAR | NUMBER OF SHEEP | PRODUCTION[1] |
|---|---|---|---|---|---|
| | *Millions* | *Million pounds* | | *Millions* | *Million pounds* |
| 1891 | 106 | 634 | 1939 | 119 | [2]1,128 |
| 1937 | 113 | 1,023 | 1940 | 123 | [2]1,115 |
| 1938 | 111 | 984 | 1941 | [2]125 | [2]1,140 |

[1] Season beginning July 1. [2] Preliminary. Compiled from official sources.

[10] WOOD, G. L., THE EXPANSION OF THE PASTORAL INDUSTRY IN AUSTRALIA, Australian Wool Annual, 1927-28, p. 42.

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The geographic distribution of sheep grazing reflects much of what has been said about "Empty Australia." The Northern Territory, occupying 17.5 percent of the total area of Australia, has less than one-tenth of one percent of the sheep; in Western Australia, which represents 33 percent of all the continent, not more than 8 percent of the sheep graze. On the other hand, the two eastern States, New South Wales and Queensland, and the State of Victoria in the southeast contain within their confines 82 percent of all the sheep. New South Wales, in which the Australian sheep industry was first developed, is by far the most important sheep State. It accounted in 1939 for about 46 percent of all the sheep and nearly 49 percent of all the wool grown in Australia.

TABLE 4.—*Australian sheep and wool production, 1939-40*

| STATE | NUMBER OF SHEEP[1] | PERCENTAGE OF TOTAL | WOOL PRODUCTION[2] | PERCENTAGE OF TOTAL |
|---|---|---|---|---|
| | *1,000 head* | *Percent* | *1,000 pounds* | *Percent* |
| New South Wales | 54,372 | 45.6 | 548,506 | 48.6 |
| Victoria | 18,252 | 15.3 | 185,000 | 16.5 |
| Queensland | 24,191 | 20.3 | 190,000 | 16.8 |
| South Australia | 9,941 | 8.3 | 105,266 | 9.3 |
| Western Australia | 9,574 | 8.0 | 81,000 | 7.2 |
| Tasmania | 2,677 | 2.3 | 18,334 | 1.6 |
| Northern Territory | 39 | (3) | 35 | (3) |
| Australian Capital Territory | 259 | .2 | (Included in N.S.W.) | |
| Total | 119,305 | 100.0 | 1,128,141 | 100.0 |

[1] Dec. 31, 1939. [2] July-June year. [3] Less than 0.1 percent.
Australia Official Handbook, June 1941, p. 52.

The concentration of sheep in one State or region and their sparseness in another are primarily caused by rainfall. The close relationship between the distribution of sheep and precipitation is so marked that the quality of the pasturage does not appear to be so important as the volume of rainfall received and retained on the land. In Australia the natural sheep-belt area lies between 10-inch- and 30-inch-rainfall lines, but the maximum sheep density in the principal sheep-carrying States lies between the lines of 21 and 23 inches annually. In the better parts of the sheep country, 3 acres to one sheep is about the average but as one moves toward the arid interior the number of acres per sheep increases until from 30 to 40 acres are required for the grazing of one sheep. This, however, greatly exceeds the safe carrying capacity of the pastures.

## Wool

In recent years Australian wool production has usually amounted to about 1 billion pounds. Between the year 1891, with 106 million sheep, which was the peak year until 1930 as regards sheep numbers, and 1938-39 to 1940-41, with an average of 117 million sheep, wool production has increased from 634 million pounds to 1,056 million, or 65 percent. Since sheep numbers increased only by 9 percent, the rise in wool production was caused largely by the improvement in sheep-breeding methods; the latter were responsible for an increase in the yield of shorn wool per sheep from about 5.5 to 8 pounds (greasy basis), or 45 percent. Thus with less than one-sixth of the world's sheep, Australia produces one-quarter of the world's wool supply and 38 percent of all wool entering international trade. Perhaps even more important is the fact that approximately 80 percent of the total clip is contributed by merino sheep, which produce the finest fleece, and that 50 percent of the world's production of fine-quality merino wool originates in Australia.

The annual gross value of the wool clip makes it the most important agricultural item produced in Australia, whether of pastoral or crop nature. In 1938-39 the gross value of wool was estimated at £42 million ($159 million), or 49 percent of the estimated value of all pastoral products. But it is in the export trade that the full significance of wool growing becomes evident. In the 3-year period 1926-27 to 1928-29, wool exports accounted for 44 percent by value of the total export trade of the country. The relative importance of wool exports in the total export trade has declined since then, but in 1936-37 to 1938-39 they still represented one-third of all the exports.

Despite the new peak in sheep numbers and wool production, the possibilities for limited expansion, if the demand for wool should continue strong, are not excluded. In this connection it may be pointed out that little expansion of pastoral areas has taken place since the early 1890's. By that time the chief agricultural resources of Australia had been marked out, and the main lines of land utilization laid down. In addition, in most parts of Australia sheep grazing had already been pushed near the limits imposed by conditions of rainfall.

## Cattle

The cattle branch of the pastoral industry is divided between dairy cattle, supporting the very important dairy industry, and the more numerous beef cattle upon which the less important beef industry is based. The great impetus that the development of the export trade in Australian butter gave to the dairying industry led to a considerable increase in numbers and improvement in quality of the dairy herds in the well-watered, rich pastures of Victoria, New South Wales, and southern Queensland, in particular. On the other hand, beef-producing cattle are mainly raised in the tropical districts; i. e., in the northern parts of Queensland, in the Northern Territory, and in the Kimberley district in the north of Western Australia. Table 5 shows the number of cattle, both for beef and for dairy purposes, in the several Australian States.

TABLE 5.—*Australian cattle and geographic distribution, 1938*

| STATE | BEEF | PERCENT OF TOTAL | DAIRYING | PERCENT OF TOTAL |
|---|---|---|---|---|
| | *1,000 head* | *Percent* | *1,000 head* | *Percent* |
| New South Wales | 1,786 | 18.8 | 1,026 | 30.6 |
| Victoria | 808 | 8.5 | 889 | 26.8 |
| Queensland | 5,046 | 53.0 | 1,051 | 31.3 |
| South Australia | 155 | 1.6 | 164 | 4.8 |
| Western Australia | 639 | 6.7 | 129 | 3.8 |
| Tasmania | 169 | 1.8 | 94 | 2.7 |
| Northern Territory | 899 | 9.5 | - | - |
| Australian Capital Territory | 6 | .1 | 1 | (1) |
| Total | 9,508 | 100.0 | 3,354 | 100.0 |

[1] Less than 0.1 percent. Australia Official Handbook, June 1941, p. 52.

There are over 60,000 farms in Australia on which dairying is the main occupation, employing more than 165,000 people, or 37 percent of "persons permanently engaged in rural occupations." The area under the "principally dairying" farms amounts to over 10 million acres, while the capital invested in the dairy industry was estimated in the early 1930's at £255 million ($800,000,000).

The dairy herds of Australia were severely depleted during the drought of 1914-15, when the number was reduced to 1,684,000. Following that year there has been a continuous expansion, particularly since the 1920's. Within the years 1914-1938 milk production has increased by 43 percent; the increase was largely due to the increased number of dairy cattle, rather than to any considerable increase in yield per cow.

The average yield for Australia is 370 gallons. In spite of some improvement, the average yield per cow in Australia is low compared with the yield in those countries which represent its main competitors in the export trade. In New Zealand, for example, the average annual (1937-1939) milk yield per cow was estimated at 520 gallons, or 47 percent above that in Australia, or 18 percent more than in Victoria, Australia's most efficient milk-producing State.

TABLE 6.--*Australian dairy production, 1924-25 to 1938-39*

| YEAR | TOTAL MILK FOR ALL PURPOSES | BUTTER | CHEESE | CANNED MILK[1] |
|---|---|---|---|---|
| | *Million gallons* | *Million pounds* | *Million pounds* | *Million pounds* |
| Average 1924-25 to 1928-29 | 801 | 282 | 30 | 57 |
| Average 1929-30 to 1933-34 | 1,005 | 382 | 34 | 47 |
| 1934-35 | 1,185 | 470 | 40 | 64 |
| 1935-36 | 1,138 | 434 | 39 | 52 |
| 1936-37 | 1,079 | 396 | 45 | 69 |
| 1937-38 | 1,157 | 430 | 57 | 78 |
| 1938-39 | 1,189 | 456 | 66 | 72 |

[1] Condensed, concentrated, and powdered. Compiled from official sources.

The gross value of dairy products, (including whole and condensed milk, cheese, and butter) amounted in 1938-39 to £42 million ($159,000,000). Of this sum, butter accounted for 67.5 percent. While the value of dairy products approaches that of wool, the former play a much smaller role in Australia's economy. All the whole milk, three-quarters of the condensed milk, and over 50 percent of the butter and cheese production are consumed locally, whereas only about 10 percent of the wool output is consumed in Australia. In consequence of this, the 1938-39 exports of dairy products, the bulk of which was consigned to the United Kingdom, constituted only 11 percent of total exports, as against 31 percent for wool. The fact, however, should not be overlooked that with exports of nearly £15 million ($57,000,000) it constituted in that year the second most important export commodity.

The possibilities of expanding the dairy industry lie chiefly in raising the milk yields. In the words of an official Australian report, it "... is ideally suited for intensive development because it is conducted mainly in regions of liberal rainfall and fertile soil. It is of such magnitude that a relatively small increase in output from each dairy cow [10 pounds] results in a large addition to the national income."[11]

## Beef

The Australian beef-cattle industry on the whole has been unable to make much headway in recent years. The advent of refrigeration and the possibility of shipping meat overseas resulted in a rise in cattle numbers, including both beef and dairy, from an annual average of 8 million in the decade of 1880-89 to an average of 11 million in the next decade. This was followed by a decline, and the high level of the 1890's was not exceeded until toward the end of the world war of 1914-18 and the years immediately following. The peak of 14.5 million cattle was reached in 1921; the reduction in numbers that took place in the years following was entirely at the expense of beef cattle. The average annual number of dairy cattle has increased from 2.1 million in 1921-25 to 3.3 million in 1934-38, or 57 percent; on the other hand, between the same periods, beef cattle have declined in average numbers from 11.6 to 10.1 million, or 13 percent.

[11] Report of the Federal Dairy Investigation Committee, vol. 1, Farm Production, p. 130, 1930, Canberra. Quoted in Windett's, N. M., "Australia as Producer and Trader, 1920-1932." p. 87, London, 1933.

TABLE 7.–*Australian cattle numbers, 1921-38*

| YEAR | BEEF | DAIRY | TOTAL | YEAR | BEEF | DAIRY | TOTAL |
|---|---|---|---|---|---|---|---|
| | *Million* | *Million* | *Million* | | *Million* | *Million* | *Million* |
| Average 1921-1925 .... | 11.6 | 2.1 | 13.7 | 1936 ..... | 10.0 | 3.5 | 13.5 |
| Average 1926-1930 .... | 9.5 | 2.1 | 11.6 | 1937 ..... | 9.2 | 3.8 | 13.1 |
| Average 1931-1935 .... | 10.9 | 2.4 | 13.3 | 1938 ..... | 9.3 | 3.6 | 12.9 |

Compiled from official sources.

The failure to expand the meat industry is attributable to both external and internal factors. The leading meat market, the United Kingdom, prefers chilled to frozen meat. South American beef had a shorter sea voyage and could be shipped to Britain in the chilled condition. Prior to 1932-33, for technical reasons, Australia had not been able to send chilled meat at all over the long journey to Europe and had to confine the export to frozen beef, the market for which was limited, and prices were relatively low. The second element that impeded the progress of the industry was the poor quality of the animals. The great distances which have to be covered by the animals on foot on their way to the stockyards, as well as the variability of seasons, frequently impaired their quality. For this reason it has been stated: "Even when the technical obstacles to export in the chilled form are removed, the severe conditions of feeding and transport and the lack of early maturing breeds will continue to render Australian cattle inferior in type, size, and meat quality to the South-American variety."[12]

The Australians are among the largest meat consumers in the world. The per capita consumption of beef and veal is more than double that of the United States, and twice that of the United Kingdom. As regards all meat, other than poultry, the yearly consumption of an Australian was 234 pounds (1938-39) compared with 141 pounds in Great Britain and 124 pounds (1937) in the United States. This explains why in 1938-39, out of a total beef output of 1,253 million pounds, Australia alone consumed 969 million pounds, or 77 percent of the total. In addition to cattle slaughtered for beef, from 18 to 19 million sheep and lambs were slaughtered each year for meat. During the year 1938-39, for instance, production of mutton and lamb in Australia amounted to 717 million pounds, of which 527 million pounds (73 percent) were consumed locally. The 27 percent exported was mainly lamb, and was valued at £4.8 million. In the same year, exports of all types of meat were valued at £11.8 million, or 8.7 percent of all exports.

The principal products of the pastoral industries have been indicated, and so have been their respective shares in Australian agriculture, as well as in the country's economy. By way of summary, it should be noted that in 1938-39 the gross and net value of the produce of pastoral industries (including dairying) represented 58 percent and 67 percent, respectively, of all agricultural production. Furthermore, since the country's economy so largely depends upon exports, it is in this field that the pastoral industries, now as in the past, continue to make their greatest contribution. In 1938-39 they accounted for 54 percent by value of all exports.

## AGRICULTURE PRODUCTION

Important as the pastoral industries are, the place of grain crops need not be minimized even though the crop acreage is but a fraction of the country's total area. The gross value of crop output is considerably below that of the pastoral industries (including dairying), and the net value is even lower. Yet the fact remains that crop

[12] Windett, N. M., AUSTRALIA AS PRODUCER AND TRADER, 1920-1932. p. 67, London, 1933.

TABLE 8.—*Australian production and gross value of principal crops, 1938-39*

| CROP | UNIT | PRODUCTION | VALUE |
|---|---|---|---|
| | | *Thousands* | *Thousands* |
| Barley (Malting) | Bushels | 9,704 | 1,417 |
| Corn | Bushels | 7,057 | 1,503 |
| Oats | Bushels | 15,555 | 2,085 |
| Wheat | Bushels | 155,369 | 21,989 |
| Hay | Bushels | 3,321 | 12,704 |
| Potatoes | Long tons | 274 | 3,649 |
| Sugarcane | Long tons | 5,679 | 9,178 |
| Sugar beets | Long tons | 13 | 27 |
| Grapes | Long tons | 402 | |
| Wine | Gallons | 14,958 | 3,924 |
| Raisins and currants | Hundredweight | 1,500 | |
| Cotton, unginned | Pounds | 13,688 | 230 |
| Tobacco | Pounds | 4,149 | 360 |
| Green forage | | | 2,999 |
| Market-garden | | | 2,473 |
| Fruit | | | 9,695 |
| Other crops | | | 4,618 |
| Total | | | [1] £76,851 |

[1] About $290,000,000; the average July-June 1938-39 rate of exchange for the pound was 377.41 U.S. cents. Compiled from official sources.

TABLE 9.—*Australian principal crops, area and relative importance, 1938-39*

| CROP | N.S.W. | Vic. | Q. | S.A. | W.A. | Tas. | N.T. | A.C.T. | AUSTRALIA | PERCENT OF TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| | *1,000 acres* | *1,000 acres* | *1,000 acres* | *1,000 acres* | *1,000 acres* | *1,000 acres* | *1,000 acres* | *1,000 acres* | *1,000 acres* | *Percent* |
| Wheat, grain | 4,651 | 2,748 | 442 | 3,080 | 3,413 | 10 | - | 2 | 14,346 | 61.1 |
| Wheat and oats in hay | 1,069 | 1,105 | 66 | 519 | 408 | 80 | - | 3 | 3,250 | 13.8 |
| Oats, grain | 399 | 658 | 9 | 267 | 426 | 25 | - | (1) | 1,784 | 7.6 |
| Green forage | 573 | 109 | 449 | 276 | 352 | 29 | - | 1 | 1,789 | 7.6 |
| Barley | 14 | 176 | 14 | 457 | 75 | 9 | - | (1) | 745 | 3.2 |
| Corn | 122 | 19 | 183 | (1) | (1) | - | - | - | 324 | 1.4 |
| Sugarcane | 21 | - | 336 | - | - | - | - | - | 357 | 1.5 |
| Orchards | 86 | 71 | 33 | 29 | 22 | 31 | (1) | (1) | 272 | 1.2 |
| Vineyards | 17 | 42 | 3 | 58 | 6 | - | - | (1) | 126 | .5 |
| Potatoes | 17 | 34 | 10 | 4 | 6 | 27 | - | (1) | 98 | .4 |
| Cotton | - | - | 66 | - | - | - | - | - | 66 | .3 |
| Tobacco | 1 | 2 | 4 | (1) | 1 | (1) | (1) | - | 8 | (2) |
| All other crops | 80 | 55 | 120 | 34 | 10 | 32 | 1 | 1 | 333 | 1.4 |
| Total | 7,050 | 5,019 | 1,735 | 4,724 | 4,719 | 243 | 1 | 7 | 23,498 | 100.0 |

[1] Less than 500 acres. [2] Less than 0.1 percent.
N.S.W., New South Wales; Vic., Victoria; Q., Queensland; S.A., South Australia; W. A., Western Australia; Tas., Tasmania; N.T., Northern Territory; and A.C.T., Australian Capital Territory. Compiled from official sources.

production not only supplies Australia with all its grain requirements for food and feed, but is large enough to provide the country with an exportable surplus, chiefly wheat and flour, which in 1938-39 accounted for nearly one-fifth of the total value of Australia's exports despite below-average shipments of wheat, including flour.

The expansion of the crop area of Australia was practically uninterrupted from 1860 to 1915-16 when, as a result of a special effort to raise more food during the world war of 1914-18, 18.5 million acres were cultivated. Thereafter the cropland was subjected to sharp fluctuations; it reached a low of 13.3 million in 1919-20 and a peak of 25 million acres in 1930-31. In 1938-39 the crop area was estimated at 23.5 million acres. The fluctuations are due to the fact that wheat is the crop most extensively grown in Australia, and material changes in the total area of crops are largely a reflection of variations in the acreage sown to this cereal. On the whole, the crop acreage accounts for only 1 percent of the total area of Australia. Yet, despite the relatively small area, there are over 3 cultivated acres per inhabitant. This compares favorably with such a country as the United States.

Wheat, hay, and oats predominate (table 9). In view of the fact that the major portion of hay grown in Australia is made up of wheat or oats cut green for feeding as hay, it may be stated that 82 percent of the crop acreage is under wheat and oats whereas wheat alone accounts for 61 percent of the crop area. The remaining crops in order of importance, according to acreage, are green forage (mainly alfalfa), barley, sugarcane, corn, fruit, potatoes, and vines.

## Wheat

Wheat is by far the most important crop of Australia, and its development merits an examination of some length. It is the only crop which is so widely grown that it forms a definite producing belt. Broadly speaking, the wheat belt occupies a broken strip of country running southward from the Queensland border, inside the coastal mountain ranges in New South Wales, and across the northwest of Victoria into South Australia, where it thins out in the arid region of the coast of the Great Australian Bight. A much smaller belt is in Western Australia; there it avoids the coastal areas of poor soil on the one side and is limited by the low-rainfall zone of the interior on the other.

Rainfall is the main controlling factor deciding the distribution of wheat growing in Australia. Generally speaking, the crop is cultivated within the zone of 10- to 30-inch annual rainfall in the southern half of the continent, but the bulk of the crop is grown in districts where the rainfall is less than 25 inches. The growing season of the crop is almost invariably in the months April to October; consequently the rainfall during that period is of more significance to wheat growers than the total annual rainfall. In the State of Victoria, for instance, "80 percent of the fluctuations of the wheat yield about the normal depend upon the critical spring rainfall, while the remainder of the variations are related to the weather of the previous and the following months."[13]

The conditions which stimulated the development of the wheat industry in Australia were both those common to the Western Hemisphere wheat-producing countries, as well as those peculiarly Australian in character. Chief among the former were the availability of the soil and farmers to till it, large-scale operations, and an increasing demand for cheap food from the countries of the Old World, particularly from Great Britain. The growth of Australian population through immigration following the discovery of gold, the need for new outlets for labor after the gold boom ended, and the improvement in transportation facilities were the other elements in the picture.

The expansion of wheat production that took place in Australia represented not merely a response to the growth of foreign and domestic markets, but reflected also a progressive adjustment of wheat growing to the soil and climatic conditions of the Australian environment. Although the main improvements in the methods of cultivation did not begin to have full effect until the turn of the century, a number of inventions had been made that permitted the cultivation of new types of soil and the lowering of production costs. These refer to the mechanical equipment and its wide utilization, the recognition of the vital significance of superphosphate as an aid to production, and, finally, the successful breeding of improved strains of wheat suitable for varying local circumstances of soil and climate. On the other hand, the collapse of prices in 1893, and again in 1921 and 1929, and serious competition from other surplus-producing wheat countries have tended to retard the growth of the industry.

13 BARKLEY, HENRY. CLIMATIC FACTORS AFFECTING THE DISTRIBUTION AND LIMITS OF THE POPULATION OF AUSTRALIA, in the "Peopling of Australia," edited by Phillips, P. D. and Wood, G. L., Melbourne University Press, 1930, p. 190.

TABLE 10.—*Australian wheat production and acreage harvested*

| PERIOD | AREA | PRODUCTION | YIELD PER ACRE |
|---|---|---|---|
| | *1,000 acres* | *1,000 bushels* | *Bushels* |
| Average 1860-61 to 1869-70 | 831 | 10,622 | 12.77 |
| Average 1900-1 to 1909-10 | 5,711 | 56,058 | 9.82 |
| Average 1910-11 to 1919-20 | 8,928 | 95,480 | 10.69 |
| Average 1920-21 to 1929-30 | 11,291 | 135,400 | 11.99 |
| Average 1929-30 to 1938-39 | 14,345 | 169,398 | 11.81 |
| Annual 1939-40 | 13,276 | 210,160 | 15.83 |
| Annual 1940-41 | 12,454 | 82,654 | 6.63 |
| Annual 1941-42 | 12,654 | 163,140 | 12.89 |

Compiled from official sources.

The main wheat-producing States of Australia are New South Wales, Victoria, South Australia and Western Australia. In 1935-36 these four States had a total of 57,529 holdings growing wheat; the average sown area per holding was 227 acres. Actually, only 20 percent of the wheat area is in holdings of less than 200 acres each, 56 percent is in holdings of 200 to 500 acres, and the remaining 24 percent, in holdings of over 500 acres.

The over-all picture of Australia's wheat industry in the past 80 years shows an upward trend, but a closer examination of the acreage data reveals an uneven development. As a result of the special war effort, 12.4 million acres were under wheat in 1915-16. After that, however, there was a serious decline, brought about by war conditions and unfavorable seasons, and the area in 1919-20 fell to 6.4 million acres, or only half that of 1915-16. From 1920-21 onward there was a rapid expansion until a peak of 18 million acres was reached in 1930-31. The subsequent decline was brought about by unprofitable prices for the grain during the depression years.

The wheat output for the 10 years 1929-30 to 1938-39 averaged 169 million bushels. But as in the case of acreage, the output has fluctuated sharply: 133 million bushels in 1934-35 and a record of 214 million bushels in 1932-33. This was caused not only by changes in acreage but by the variability of yield as well. This was especially true of 1940-41, when the average yield per acre was only 6.7 bushels and the output, 83 million bushels, the lowest recorded since 1919-20. The virtual failure of that season's crop resulted from drought conditions, which prevailed throughout the wheat belt. The best average yields for single seasons since 1901-2 were obtained in 1920-21, 1924-25 and 1939-40, when they were 16, 15.2, and 15.8 bushels, respectively. Annual averages for the past four decades were 9.8, 10.7, 11.9, and 11.8 bushels per acre. It is important to note that the average Australian wheat yields are lower than those of Argentina, Canada, and the United States, and that heat and lack of moisture, especially at the end of the growing season, appear to be the limiting factors affecting Australian wheat yields.

Normally the production of wheat greatly exceeds Australian requirements. In the years 1934-35 to 1938-39 domestic needs claimed one-third of the output, and the remainder was exported. In 1909-13, prior to the outbreak of war, Australia's exports averaged 49 million bushels, or 7.5 percent of world wheat exports, and the country ranked sixth among exporters of this grain. Since 1913 Australia has made the greatest relative advance as an exporting country. Although still tenth as a wheat producer, accounting in 1934-38 for only 3 percent of the world's wheat, Australia has been for a considerable period among the Big Four exporters (Canada, Argentina, United States and Australia).

During the marketing seasons 1934-35 to 1938-39 Australian wheat exports accounted for 18 percent of the world wheat exports; in terms of wheat, including flour, these

exports ranged between 98 and 125 million bushels, the average being 108 million bushels. It should be noted, however, that drought in North America, as well as the American policy of price maintenance, which had the effect of restricting exports in some seasons, helped to stimulate exports. On the whole, next to wool, wheat is the most important single commodity exported from Australia, representing during the years 1935-36 to 1939-40 13 percent by value of Australian total exports.

In considering the future of the wheat industry, a number of limiting factors come to the fore. They include conditions of rainfall and soils, on the one hand, and the problem of foreign markets on the other. What the situation is with respect to soils may be gathered from the following statement:

> "Comparisons are dangerous, but it is clear that there is no vast expanse of soil wholly suited to wheat-growing comparable to that which occurs in parts of North America, the Argentine or Russia. Special soils of various types, often in widely-separated districts, are most productive; intervening country is less so, and in many cases unsuitable for the crop."[14]

It will be recalled in this connection that in 1930-31 the wheat area of Australia reached as high a figure as 18 million acres, but that figure undoubtedly included a considerable area of marginal land. To a smaller degree the same held true in 1939-40 when the area under wheat amounted to 13 million acres. This is substantiated by the 3-year program (1941-43) to eliminate marginal wheat lands.

As to foreign markets, much will depend upon the operation of the International Wheat Agreement recently negotiated, and to which Australia is a subscriber. In this connection, it may be noted that the Agreement aims to stabilize, rather than expand, the wheat industries of the principal wheat-exporting countries. This is to be achieved through the allotting of export quotas based on past performance. Of course, increased consumption in the wheat-importing countries would probably result in some acreage expansion on the part of the exporting countries covered by the Agreement. But the surest way of expanding Australia's wheat industry is through an increase in the country's population.

## Hay, Oats, Barley, and Corn

Next in importance to wheat is hay, which for the season 1938-39 averaged 13.8 percent of the crop acreage. In most European countries, hay consists almost entirely of meadow and other grasses, but in Australia a very large proportion consists of wheat and oats, cut green and cured as hay, and alfalfa. The hay output is estimated at about 3.5 million tons, practically all of which is utilized domestically as feed. With approximately 7.5 percent of the entire crop area devoted to oats, the output of 16 million bushels represents the second largest grain crop of Australia. The demand for the grain for oatmeal varies from 1.5 to 2 million bushels annually. The cereal is mainly used as feed grain. The average yield per acre of oats varies considerably in the different States, but for the country as a whole it averages around 12 bushels to the acre. This is only about half as large as the yield of oats in other countries.

Barley is a fairly large crop, and the area sown to the grain expanded from an average of 318,000 acres in 1919-20 to 1928-29 to 495,000 acres in 1929-30 to 1938-39. In 1938-39 the area reached a peak of 745,000 acres. South Australia, with 61 percent of the total acreage, is the leading producer, whereas Victoria with 24 percent is the second largest. The crop is grown chiefly in the wetter and cooler portions of the wheat belt. In 1938-39 over 4 million bushels of the total output of about 11 million

[14] WADHAM, S. M., and WOOD, G. L., *op. cit.*, p. 186.

bushels were utilized for feed and seed; about 3.7 million bushels for malt works; 2.6 million bushels were exported; and the remainder was utilized domestically for a number of other uses.

Notwithstanding the extensive cultivation of corn in other countries, in Australia this crop has never been of much importance, and it has been declining in recent years. The greatest area grown was in 1910-11, when it amounted to 415,000 acres. During the past 10 years, it has fluctuated around 294,000 acres, with an output of about 7 million bushels. The crop is grown largely for green forage, particularly in connection with the dairying industry.

## Green Forage

A considerable area, 7.6 percent of the total cropped land, is devoted to the production of green forage, mainly intended as feed for the dairy industry. Under normal conditions, the principal crops cut for green forage are corn, sorghum, rape, and alfalfa, but small quantities of sugarcane also are so used. In certain circumstances, the area sown to green forage may be supplemented by areas of cereals sown originally to grain and cut green for hay. All of this goes into the making of green forage in Australia.

## Sugar

The outstanding tropical crop of Australia is sugarcane, and 94 percent out of a total area of 357,000 acres (1938-39) is in Queensland. The greater portion of the cane is grown on relatively small holdings (40-50 acres) and fairly intensive methods of cultivation are practiced. The need for a rainfall exceeding 40 inches confines the industry close to the eastern seaboard of Queensland. It is worth noting that Australia is the only country in the world that grows sugarcane with white labor. The fact that it is a highly protected industry explains, in part, this development.

In 1939-40 raw-sugar production amounted to 929,000 tons from 6.3 million tons of cane crushed. The respective figures for the decade 1929-30 to 1938-39 were on the average 657,000 and 4.7. The sugar output is more than sufficient to supply local requirements. The average production amounts to 244 pounds per capita, whereas per capita consumption is estimated at 118 pounds. More than half of the crop is exported.

## Orchards and Vineyards

Australia has under orchards some 272,000 acres on which a great variety of fruit is grown, ranging from bananas, pineapples, paw-paws, mangoes, and guavas of the tropics to citrus in the sub-tropics and pears, cherries, apricots, peaches, and apples in the colder parts of the Temperate Zone. The output in 1938-39 was valued at nearly £10,000,000. Apples are commercially the most important fresh fruit and are grown extensively in all States. Nearly 100,000 acres, or over a third of the orchard acreage is planted with apple trees. Next in importance are the citrus fruits (47,000 acres), which are grown largely in the coastal areas of New South Wales and in the irrigated areas of the Murray Valley.

Before the world war of 1914-18, fruit production, with the exception of the Tasmanian apple-export trade, was mainly for domestic consumption. The substantial export trade built up in the past 2 decades consists mainly of apples and pears, and particularly the former. Approximately 38 percent of the apple crop of some 11 million bushels and 27 percent of the pear crop of 2.2 million bushels were exported in 1938-39. Canning is now an important branch of fruit growing, and the principal

items canned are apricots, pears, peaches and pineapples. Of the 150 million pounds canned in 1938-39, 81 million pounds were exported. The value of all fruit exports amounted to £3.9 million.

Wine making dates back to the early days of settlement, but since Australia is not a wine-drinking country (only 0.3 gallon per capita per year), the production of wine has not increased so rapidly as the suitability of the soil and climate would appear to warrant. In recent years, vineyards covered an area of 118,000 acres. The greater part of the grapes grown is made up of varieties suitable for drying. In the past thirty years, Australia has not only produced sufficient raisins and currants for home consumption but has been able to maintain a large export trade. In all, 50,000 tons of raisins and 24,000 tons of currants, with a combined value of £2.7 million ($10,000,000), were exported in 1938-39, out of a total of 51,000 tons of raisins and 24,000 tons of currants produced that year. The yearly wine production averages 16 million gallons, of which approximately one-fourth, valued at about 1 million pounds, was exported.

### Tobacco and Cotton

In addition to the enumerated crops, there are a number of minor ones, chief among which are tobacco and cotton. These are perhaps the only two important crops the output of which falls far short of Australia's requirements. In the case of tobacco, production in 1938-39 (4 million pounds from nearly 8,000 acres) was only 15 percent of domestic needs. Cotton consumption in 1939 amounted to about 37,000 bales, but only one-fourth of this was produced in Australia; the remainder had to be imported from the United States and India. Because of the wide discrepancy between domestic production and consumption, the Government has made special efforts to encourage a greater acreage. Farmers received aid between 1920 and 1936 in the form of minimum prices fixed by the Commonwealth and Queensland (the only State producing cotton) Governments and from 1937 to date in the form of bounties based on Liverpool prices. Under this stimulus, the acreage increased considerably in the thirties, yet output lagged far behind. The chief difficulty must be attributed to the fact that cotton growing in Australia has proved to be very hazardous in consequence of insufficient and irregular precipitation. This explains the sharp fluctuations in yield ranging during the years 1929-38 from 247 pounds to as low as 67 pounds per acre. In order to stabilize cotton production, attention is being paid to the possibility of cultivating cotton under irrigation.

## CONCLUSION

In the preceding pages an attempt has been made to point out what Australia's agricultural resources are, how they have been developed, and the limitations that impede their development. Some of the basic features may be recapitulated here.

Australia is a country of large agricultural resources in which pastoral products occupy a preeminent position. It is the world's largest producer and supplier of wool, the third largest exporter of wheat, and a large exporter of dairy and meat products. Agriculture accounts for 75 to 80 percent of the country's exports, and, notwithstanding the growth of manufacturing, Australia's agriculture remains the pivot around which the country's economy revolves.

A population of seven million on 3,000,000 square miles conjures up visions of small numbers on a lot of land, of underpopulation and underdevelopment in the presence of vast agricultural resources. These resources are undoubtedly considerable but not

unlimited; in fact, contrary to widespread, albeit ill-founded notions, they are quite limited in comparison with the size of the country. Between two-thirds and three-quarters of the continent has a climate that does not permit effective agricultural utilization of the land. Irrigation as a way out has been impracticable, and where attempts were made to irrigate Australia's deserts, the net result was great financial losses. To date there are only approximately 800,000 acres of irrigated land.

Apart from the desert areas, there are millions of acres of land that might be put to use, providing, however, the cost involved in cultivating the marginal acres is not a primary consideration. In reality, low costs and profitability are the cardinal factors in adding new acreage. But in the words of a student of the problem:

"Much of the land for ... extension would have to be cleared and transport provided at heavy cost. A large proportion of new areas must consist of light soils and dry areas of doubtful capacity. Furthermore, even in the settled portions, where the greatest development is possible, agriculture is already operating under condition of diminishing returns."[15]

This, together with the all-important factor of rainfall deficiency, which was discussed in detail in earlier pages, limits seriously the agricultural capacity of the country to absorb a greater population. And this is not only because the new settlers wish to maintain the high standard of living to which the Australian population as a whole has been accustomed. In this connection, the main conclusion of a basic study on land utilization in Australia can hardly be gainsaid: " ... whatever the standard of living accepted by the inhabitants, four-fifths of the country could not be settled much more densely because of rainfall deficiency or other factors."[16]

This does not preclude an increase in Australia's population, rural as well as urban, or an expansion of agricultural resources. But the basis for such development, when the controlling elements of climate and soil are kept in mind, is not in pushing back the now existing land frontiers into the dry regions; much of that has already been done and to the disappointment of all those connected with it. The future, therefore, does not appear to lie in that direction, but rather in the more intensive development of the already occupied regions of better rainfall near the coasts. This implies, of course, better care of the soil, planting more productive crops, higher yields - all of which would result in a lowering of the cost of production. Such a development is of highest importance, for the future of Australia's agriculture is inextricably bound up with world trade and the competitive position of Australian products in foreign markets. The latter constitute the external control which, perhaps more than the internal controls of climate and soil, helped to shape the nature of Australia's agriculture.

Australia's economy has been built largely around products chiefly of agricultural origin based on the expectation of a ready and, until recently, an expanding foreign market. The degree to which the prosperity or depression of Australia's agriculture, and by the same token the prosperity or depression of Australia, is dependent upon exports is evident when it is considered that approximately 90 percent of the wool output, 85 of the dried fruit, 70 of the wheat and flour, 50 of the butter, 50 of the fresh apples, 24 of the mutton and lamb, 20 of the beef, and 22 percent of the bacon, ham, and pork production are exported. A feature worth noting in conjunction with these exports, which has direct bearing upon the future of the country's economy, is

[15] WOOD, G. L., IMMIGRATION IN RELATION TO PRIMARY AND SECONDARY INDUSTRIES, p. 117 in "The Peopling of Australia," edited by Phillips, P. D. and Wood, G. L., Melbourne University Press, 1930.

[16] WADHAM, S. M., and WOOD, G. L., LAND UTILIZATION IN AUSTRALIA, Melbourne University Press. 1939. p. 323.

the position of Great Britain in relation to Australian exports (see table 11). The figures show that for wool, wheat, and dried fruits Australia has a relatively wide market, but in the case of meat, butter, eggs, sugar, fresh, dried, and canned fruits, and wine the market is almost entirely limited to Great Britain. On the whole, in recent years, Britain has absorbed about 50 percent of Australia's exports and the other parts of the British Empire around 10 percent.

TABLE 11.—*United Kingdom as market for Australian exports*

| COMMODITY | IMPORTS FROM AUSTRALIA AS PERCENTAGE OF TOTAL IMPORTS INTO UNITED KINGDOM | EXPORTS TO UNITED KINGDOM AS PERCENTAGE OF TOTAL AUSTRALIAN EXPORTS |
|---|---|---|
| Wool | 39 | 37 |
| Wheat | 22 | 61 |
| Butter | 16 | 92 |
| Beef | 14 | 99 |
| Mutton and lamb | 28 | 98 |
| Pig meat | 3 | 98 |
| Dried fruit | 39 | 58 |
| Fresh fruit | 27 | 87 |
| Eggs | 5 | 99 |
| Sugar | 17.5 | 98 |
| Wine | - | 95 |

Commonwealth Year Books and Imperial Economic Committee publications.

Since the world war of 1914-18, and particularly since the depression of the 1930's, Great Britain has been a less satisfactory outlet for Australian products.[17] The search for other markets became imperative, but the internal and external pressures for greater self-sufficiency that manifested themselves so sharply in the thirties in former customer countries tended to intensify Australia's dependence upon the British market. There was considerable discussion about the expansion of the domestic market for agricultural products. This is not a matter of raising the per capita consumption but primarily that of an increase in population. The possibilities, however, of an increase sufficiently large to take care of the surplus, over and above the volume sold in the contracting foreign markets, are limited. It has been estimated that, without immigration, by 1981 Australia's population will not exceed eight million at the present birth rate, and, with normal immigration, it will attain only about nine million.[18] Hence the conclusion that "the margins of expansion now existing for Australia in either the home or overseas markets are demonstrably very narrow."[19]

Such was the problem confronting Australian agriculture on the eve of the outbreak of the present war. For the time being, issues requiring immediate consideration must be given precedence. Once the war is over, however, the expansion of agricultural production in Australia will still be tied up chiefly with foreign markets. How Australia's agricultural resources will fare in those markets will depend much upon the kind of economic peace the post-war world will fashion.

[17] Australian foreign trade is discussed in detail by Owen L. Dawson, former agricultural attaché, Shanghai, in "Australia's Economic Position and Policy as Affected Chiefly by Overseas Markets for Agricultural Products." (Report based on a survey of Australia, completed at Washington, D. C., August 27, 1942.)

[18] HARRIS, H. L., AUSTRALIA'S NATIONAL INTERESTS AND NATIONAL POLICY, Melbourne University Press, 1938, p. 22. (Since Harris wrote his book, however, Australian birth rates have risen, and it is open to question whether his judgment could now be sustained. Birth rates per 1,000 inhabitants are not in themselves a reliable index, but such rates for the years 1935 to 1941 were: 16.55 in 1935, 17.13 in 1936, 17.43 in 1937, 17.46 in 1938, 17.65 in 1939, 18.02 in 1940, and 19.22 in 1941.)

[19] WADHAM, S. M., and WOOD, G. L., *Op. cit.*, p. 349.

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# AUSTRALIAN AGRICULTURE AND THE WAR EFFORT . . . . .

*Following the outbreak of Nazi military aggression in the fall of 1939, eleven European export outlets for Australian goods were eliminated. Thereupon, Australia, with its wealth of resources and productive capacity and roughly 70 percent of its prewar-trade wealth derived from exports of primary farm commodities undertook the systematic governmental control of agricultural marketing. A remarkable adjustment of its productive capacities resulted; Australian supplies of foodstuffs and other essential agricultural products have been made available during the past 3 years to the United Nations in nearly all parts of the world.*

The agricultural policy adopted by the Australian Government after the beginning of the present world conflict has rendered valuable assistance to the Allied Nations. The first step in specific wartime planning for agricultural production was the creation of an agricultural council consisting of the State Ministers of Agriculture and representatives of Commonwealth Departments. This council, in formulating its early wartime policy, made three decisions that have been especially advantageous to the United States and to all the United Nations:

(1) Immediate action was taken to enlarge cold-storage accommodations for surpluses of perishable agricultural commodities as an insurance against war dislocations of export trade. The establishment of such surplus reserves has rendered an invaluable service in providing food supplies for the United Nations' military forces quartered in the Pacific areas.

(2) An extensive dairy-production campaign was adopted, with special emphasis on the conversion of milk supplies into butter, cheese, and dried-milk and condensed-milk manufactures.

(3) A concentrated program of increased livestock production was undertaken. This not only contributed to the expansion of the dairy industry but also assured greater meat supplies for shipment to Britain, food for military forces in the Near East, and adequate domestic consumption, despite the quartering of American and other United Nations troops in Australia.

## POOLING OF AGRICULTURAL RESERVES

Early in 1939, the Government enacted special legislation to regulate the control of wheat production in order to limit surpluses in proportion to available storage capacities and to assure the wheat farmer of a reasonable market return on his crop investment. The net result of this endeavor has been to guarantee prices to producers but at the same time to release farmers and land areas formerly employed in wheat growing for concentration on the production of such strategic war materials as fibers (flax, ramie, and cotton) needed by the military forces of the Allied Nations. During the past year, a large acreage was planted to flax, which will be of vital assistance to both the United States and the United Kingdom in providing material for Australian manufactures of parachute harness, canvas, ground sheets, fire hose, cordages, and thread for boots and shoes. Other vital commodities produced in Australia and needed by the United States military forces are tobacco, potatoes, and many other varieties of vegetables.

## CONTROL OF AGRICULTURAL PRODUCTION AND DISTRIBUTION

Modern war requires not only sacrifices in men and money but also the production of vast quantities of food and other supplies on the land. Such a war demands cooperative yet effective control of agricultural resources. Control over the production and distribution of agricultural products is hardly less important than the control of metals and chemicals for arms and explosives. These considerations are recognized by agricultural producers in Australia as well as by those in the United States and have led the great Commonwealth of Australia to pool its resources with those of the other United Nations.

One of the great contributions that Australia has made to the war effort of the United Nations is in supplying huge quantities of wool, which prior to the war went to the markets of Germany and the rest of Europe. Australia consumed at home only a small portion of its large domestic wool production. At the beginning of the war all wool sales were stopped and negotiations began for pooling all wool supplies to meet the needs of the war. Furthermore, Australia agreed to curtail civilian use of wool in order to increase manufactures for war needs.

In response to a sudden change in the classes of wool demanded by the market, Australia, together with the other British Dominions, made the necessary adjustments in the marketing system to meet military requirements. Consequently, the open-auction method of marketing wool was abandoned in Australia, and the Government established controls over the wool trade as a vital part of its plans for economic warfare. As a result of the pooling of wool resources and the establishment of controls over marketing, Australia has been able to make an equitable division of its wool supplies among the Allies.

## CONVERSION OF PRODUCTION TO MEET WAR NEEDS

The world well knows the courage and valor of Australia's men in battle. The support given by the 7,000,000 Australians at home to the armed forces and to the war effort of the entire United Nations is not so well known; but it is, nevertheless, a vital factor in the conflict against Axis aggressors. Australia has converted the efforts of its agricultural and pastoral industries to the main job of feeding the armies and supplying the raw materials necessary for the conduct of the war. From the beginning of the war in 1939, Britain has depended upon the Dominion for large amounts of foodstuffs and other supplies. The canning of beef and mutton has been encouraged, and methods have been developed for the preparation of meat concentrates. Both Australia and the United States now use dehydrating processes for the preparation of meats and other products, and in order to provide increased beef and pork for the fighting forces, Australian civilians are changing to increased consumption of mutton and lamb.

In addition to the plans made for the establishment of new industries to provide canned meats, sausages, bacon and meat concentrates, and dried eggs for maximum help to Britain, the dairy industry has made adjustments in order to give Britain the dairy products most needed. Increased production of cheese, butter, condensed milk, and powdered milk is under way. Australia also furnishes large amounts of dried fruits to the Allies.

Today American soldiers are using milk, beef, pork, lamb, and fruits lend-leased to the United States by Australia. In fact, Australian producers are growing almost all the emergency food rations of United States armed forces in the Pacific area and,

in a like manner, are producing, manufacturing, and supplying wool and cotton clothing for American soldiers and auxiliary forces.

The remarkable growth of Australia's secondary industries since the outbreak of war has been called an industrial romance. Aircraft production has been developed, and large quantities of the raw materials needed for the manufacture of these implements of war have been supplied to the Allied Nations.

All this has not been accomplished without sacrifice by Australia. Production for civilian uses has been reduced, and consumption has been rationed. Farmers and pastoralists have changed their methods and increased their working hours to stretch the productive capacity of 7,000,000 people as far as possible. The resources of the land have been used increasingly to provide an adequate and better diet for those who fight for freedom.

## LEND-LEASE IN REVERSE

Reciprocal lend-lease aid is being provided to the United States on the same basis that it, as a nation, is providing lend-lease assistance to other countries in order that the United Nations may pool their resources in a common war effort.

The receipt of lease-lend aid by the United States from other United Nations was definitely confirmed by an agreement recently concluded in Washington whereby the United States and the Australian Commonwealth Governments, together with other members of the United Nations, specifically defined the responsibility of each Government to make available to the others, on lend-lease terms, material aid for the prosecution of the war.

In return for such aid as the United States provided Australia under the provisions of the original Lend-Lease Act of March 11, 1941, it sets forth the principles upon which the United States shall in turn receive aid from Australia. As a typical example of this assistance, American forces engaged in United Nations' military action in Southern Pacific areas since the Battle of Bataan have received quantities of foodstuffs, such as milk, beef, pork, and lamb, fresh apples, oranges, grapes, and bananas, in addition to emergency rations, such as canned meats and vegetables, at no little cost to Australia's productive facilities aside from civilian consumption needs.

Reciprocal lend-lease, such as the United States is receiving from Australia, is representative of the most economical use of the United Nations' war resources. It means conservation of both time and transport facilities by utilization of supplies at their production sources. It means, also, that civilian populations of all United Nations are members of a "share-and-share-alike" program of rationed consumption needs to provide essential goods for United Nations' fighting forces.

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